AIPHONE

RAX INTERCOM SYSTEM

For systems with up to 24 stations
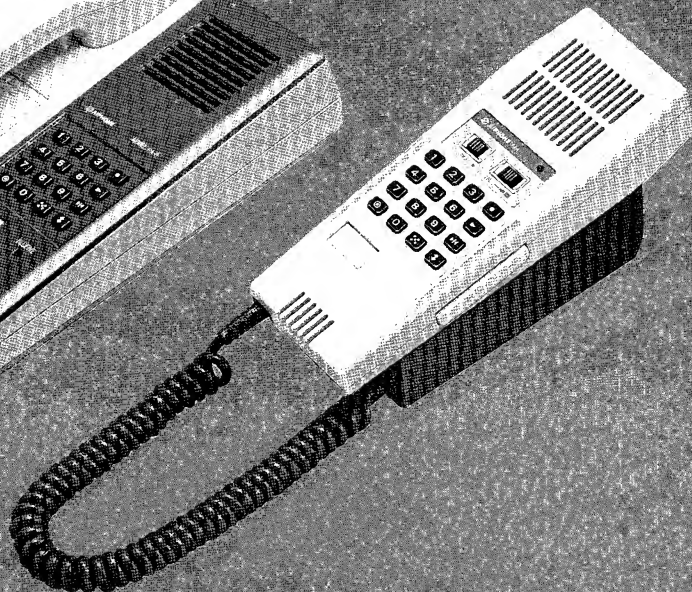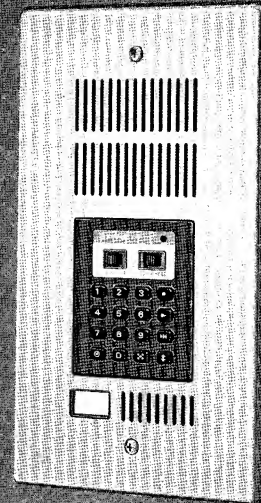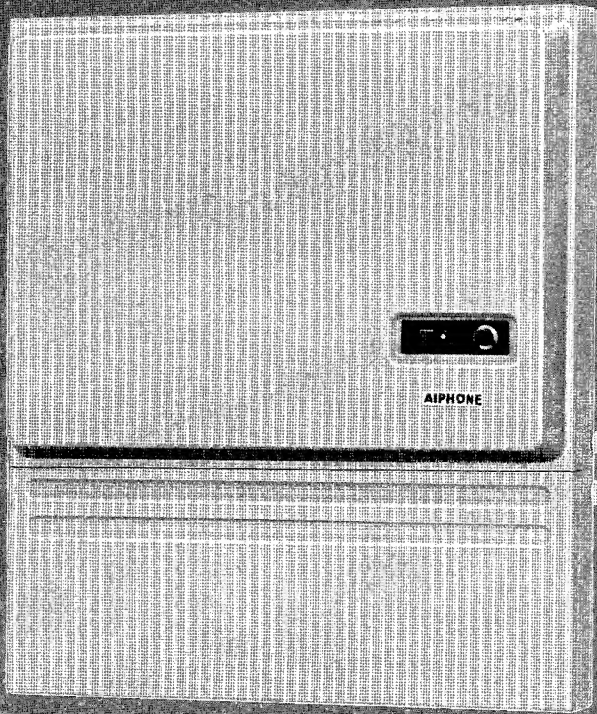
TABLE OF CONTENTS

I. Introduction

This manual presents information for installing the Aiphone RAX intercom system.

(The Central Exchange Unit is ⬚Type A⬚ version).

Included in this manual is information regarding;

- system features
- system design
- equipment requirements
- installation procedures
- specifications
- system testing

A careful study of this manual prior to RAX system installation is strongly recommended. A thorough reading and understanding can save time and money.

All the information contained in this manual is subject to change without further notice.

II. RAX System Features and Functions

System Features

* Fully electronic, microprosessor based system.
* Three systems: 8, 16 or 24 stations.
* 2 communication channels, with one separate channel either for paging or remote control.
* Total hands-free communication or telephone-privacy.
* Flush-mount sub station, allowing one-touch calling.
* Wide range of STANDARD communication functions — no add-on options required.
* Three different types of master stations: (1) Open voice, desk/wall mount, (2) flush wall-mount & (3) speaker-phone type, desk/wall mount.
* Simple 2-digit dialing. Call by pushing one button between a pair of master/sub.
* Page up to 4 individual zones with/without talkback through ceiling or horn speakers.
* All page to four zones simultaneously (No talkback in all-page mode).
* All-Call through speakers of station unit, overriding any other functions.
* Electret condensor microphones — superior voice fidelity.
* Wall-mounted, compact Central Exchange Unit, complete with terminal board and power supply.
* Remote control for operation of external devices (Background music, internal/external lights, door release, etc.).
* Accepts background music through ceiling speaker with automatic cutout during paging.
* Quick, simple home run wiring from each station to Central Exchange Unit.
* Two twisted pair per station.
* Emergency battery backup adaptor.

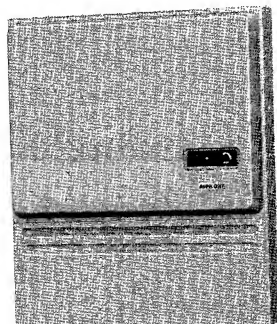## System Communication Functions

1. **Station call** . . . . .User can call and receive from any station to any other station in system.

2. **Camp-on Busy** . . . . .User can leave a request for automatic call back from a busy station.

3. **Secretary transfer** . . . . .Incoming calls can be routed to secretary or other designated **(station transfer)** station.

4. **Call transfer** . . . . .User can transfer a call from one station to another.

5. **Call holding** . . . . .User can place calling station on hold during his conversation with other station.

6. **Urgent message break-in signal** . . . . .User can signal occupied station that he has urgent message.

7. **All page** . . . . .User can page all zones simultaneously.

8. **Zone page** . . . . .User can page up to 4 zones individually.

9. **All Call** . . . . .User can page through all stations simultaneously.

10. **Talkback paging** . . . . .User can page through speakers.
Person paged can respond directly from speakers (Zone Page only).

11. **Paging with Call back** .User can page individual through speakers.
Person paged can respond from nearest station and will be automatically connected to paging party.

12. **All Call with Call back** .User can page individual through all station speakers.
Person paged can respond from nearest station and will be automatically connected to paging party.

13. **Privacy** . . . . .User can place his station in Privacy mode.

14. **Temporary Privacy** . . . . .User can release Privacy mode temporarily for reply.

15. **Master/Sub communication** . . . . .User at master station can have his own sub station.

16. **Simplex communication** . . . . .User can talk with a station in noisy area, pressing the talk button to talk, releasing to listen.

17. **Remote control operation** . . . . .User can operate BGM turn on/off, turn lights on/off, etc. by dialing from his station.

III. RAX System Design and Components
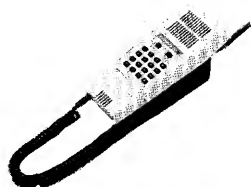
System Components
Central Exchange Unit

Models: RAX-8, RAX-16, RAX-24
Central Exchange Unit for systems up to 8, 16 or 24 stations.
Includes a central terminal board and power supply unit.
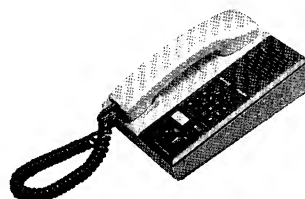
Station Equipment

Model: RA-A, Open voice master
station, with handset communication
capability. Desk/wall use.

Model: RA-C
Open voice sub station,
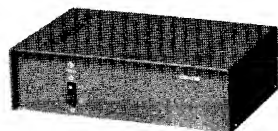flush-mount (indoor
use only).

Model: RA-B, Open voice master
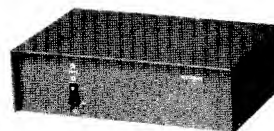station, flush mount (indoor
use only).

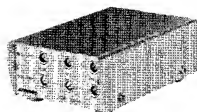Model: RA-D
Speaker-phone type
master.
Desk/wall use.

Accessories available;

Model:
PG-10B (10 watts),
Standard Paging Amplifier,
with 100V or 8 ohms output.

Model:
PG-10A (10 watts),
UL/CSA Approved Pagaing
Amplifier with 25V and
70V output (available only
in North America)

Model: MC-A
Paging Adaptor.
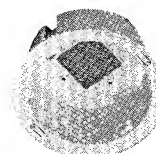
Model: PB-YKX
Talkback Adaptor.

Model: RC-A
Zone Paging Adaptor.

Model: RC-B
Remote Control Adaptor
for operating external
devices.

Model: SP-3NA
Standard 3 watt ceiling
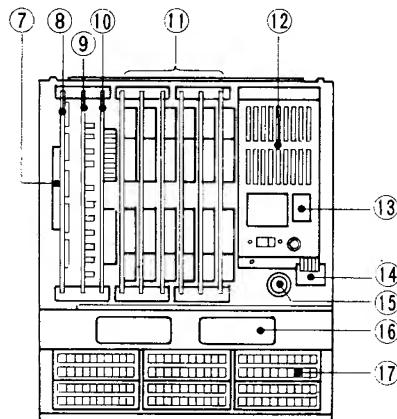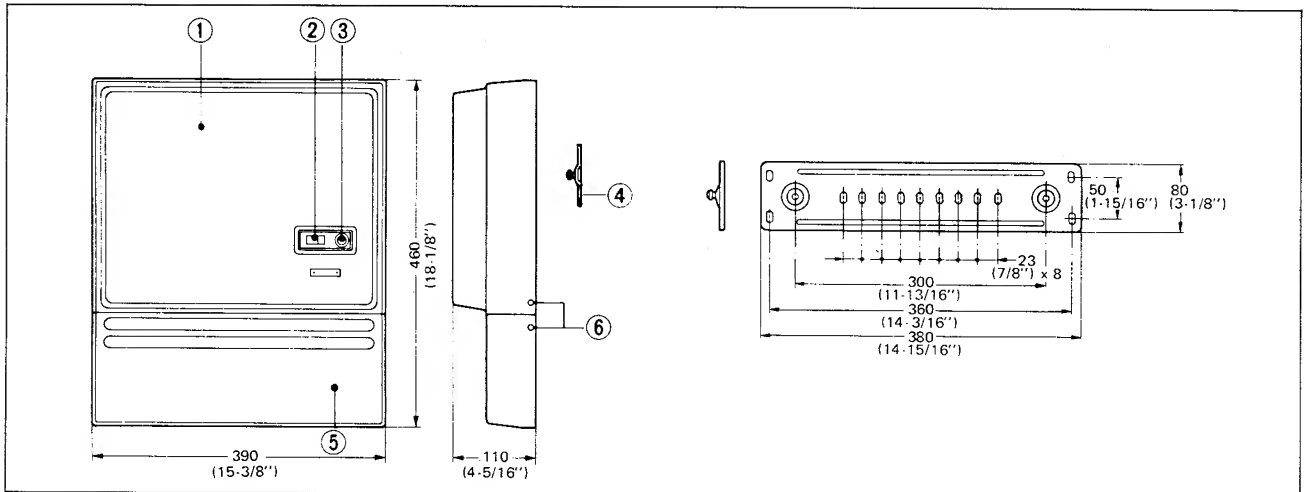speaker with built-in line
transformer.

Model: N-EA
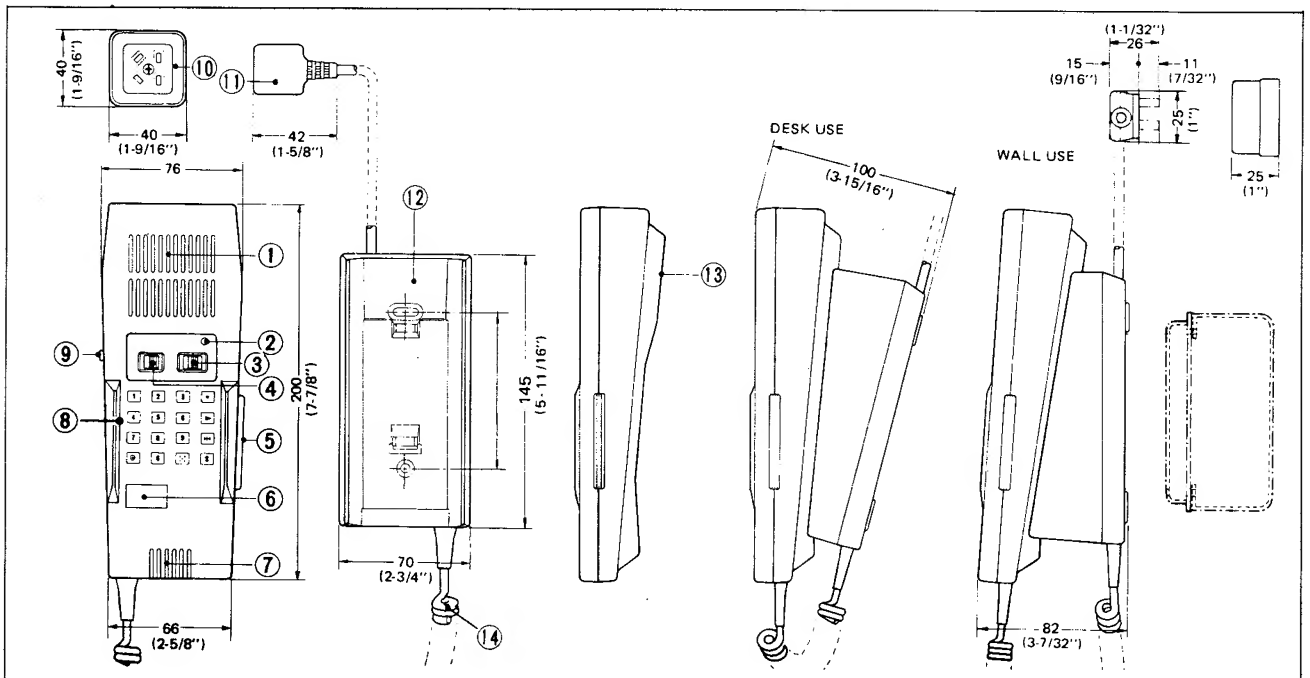Round frame for surface-
mounting of SP-3NA to ceiling.

Model: NBZ-M
Square frame for flush-mounting
of SP-3NA to ceiling.

DIMENSIONS AND PARTS IDENTIFICATIONS

Models: RAX-8, RAX-16, RAX-24

1. Main front cover
2. Power switch
3. Power lamp
4. Wall mounting bracket
5. Sub front cover
6. Screws for covers
7. Mother board
8. CPU Card (XC-060)
9. Function card (XC-061)
10. Voice-switching card (XC-062)
11. Subscriber card (XC-063)
12. Regulator unit
13. Automatic cutoff switch
(when cover is removed)
14. AC power terminals & ground terminal
15. Inlet for AC power line
16. Opening for cable from stations
17. Terminal block

Model: RA-A

1. Open voice speaker
2. Call lamp (also for secretary transfer)
3. Volume control switch
4. Privacy switch
5. Bar switch for handset communication
6. Station No. plate
7. Microphone
8. Dial key pad
9. Talk button for paging/
simplex communication
10. DR-A receptacle
11. 4P plug
12. Pedestal (die cast)
13. Receiver for handset communication
14. Coil cord

— 4 —
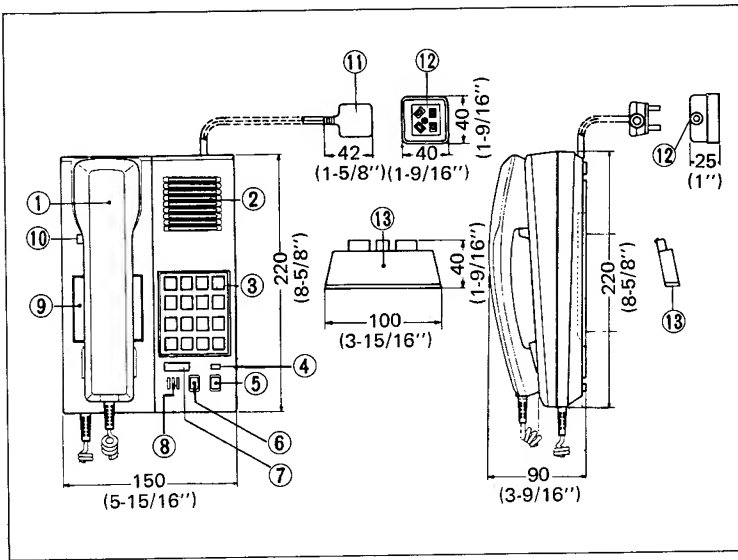
Model: RA-D (Speaker-phone type master)
1. Handset
2. Speaker
3. Dial key pad
4. Call LED (also for secretary transfer)
5. Volume control switch
6. Privacy switch
7. Station No. plate
8. Microphone
9. Directory card
10. TALK button
11. 4-pin plug w/2 m (6') cord
12. Receptacle
13. Stand
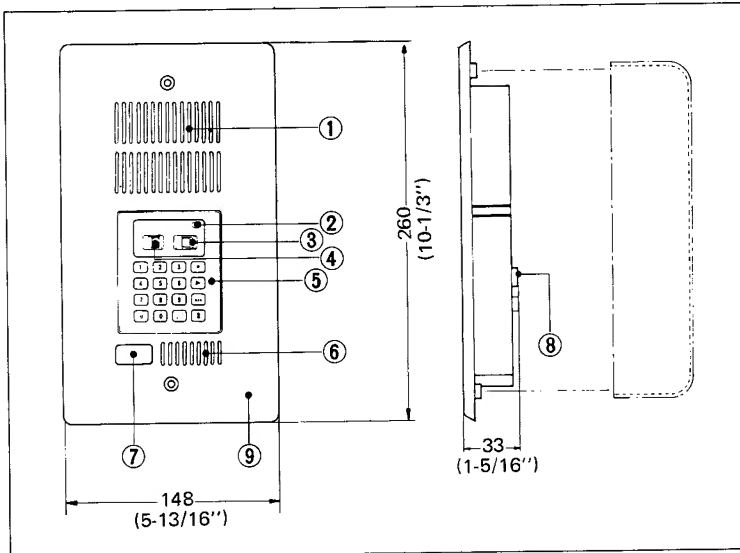
Model: RA-B (Open voice master station, flush mount)
1. Open voice speaker
2. Call lamp (also for secretary transfer)
3. Volume control switch
4. Privacy switch
5. Dial key pad
6. Microphone
7. Station No. plate
8. Terminals
9. Front panel (stainless steel)
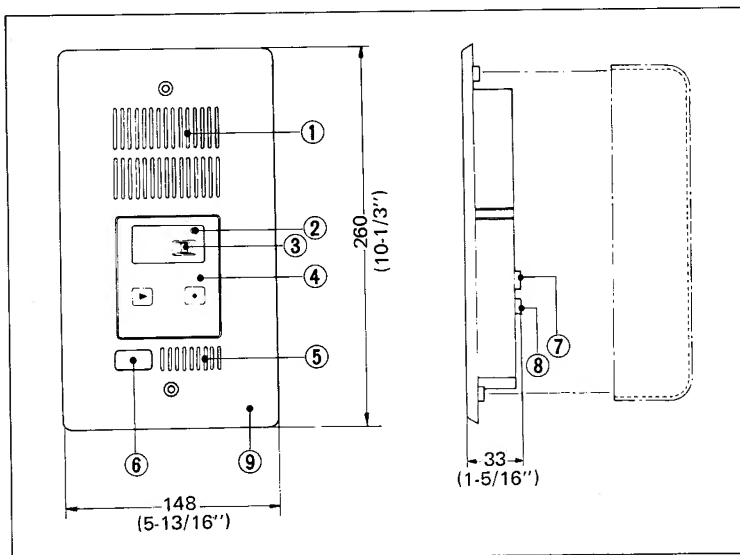
Model: RA-C (Open voice sub station, flush mount)
1. Open voice speaker
2. Call lamp
3. Volume control switch
4. Key pad
5. Microphone
6. Station No. plate
7. Terminals
8. Terminals for external switch
9. Front panel (stainless steel)

IV. RAX System Equipment Requirements

The RAX System Design Table below is to assist in determining the mix and quantity of RAX system components.

RAX SYSTEM DESIGN TABLE				
SYSTEM COMPONENTS		QUANTITY OF COMPONENTS		
		RAX-8	RAX-16	RAX-24
RAX-8	Central Exchange Unit for up to 8 stations (with 2 XC-063)	1		
RAX-16	Central Exchange Unit for up to 16 stations (with 4XC-063)		1	
RAX-24	Central Exchange Unit for up to 24 stations (with 6XC-063)			1
STATION MODEL				
RA-A	Open voice master station, with handset communication capability			
RA-D	Speaker-phone type master station	max. 8	max. 16	max. 24
RA-B	Open voice master station, flush-mount			
RA-C	Open voice sub station, flush-mount			
OPTIONAL ACCESSORIES				
PG-B PG-10B	Standard amplifier (available except in N. America) 10W	Up to 4 separate zones either for paging or remote control		
PG-A PG-10A	UL/CSA approved amplifier (available only in N. America) 10W	Each zone requires 1 PG-A or PG-B amplifier, 1 MC-A adaptor and a required number of speakers. (Does not reduce station capacity)		
MC-A	Paging adaptor	OR When using one RC-A adaptor, as well as a required number of speakers for each paging zone,		
SP-3NA NBZ-M N-EA	Standard 3 watt ceiling speaker Square frame for SP-3NA. Round frame for SP-3NA.	system can have only to use 1 each PG-A (or PG-B) amplifier, MC-A adaptor, PB-YKX talkback adaptor. (Does not reduce station capacity)		
RC-A	Zone paging adaptor			
PB-YKX	Talkback adaptor	1 for each paging zone where talkback is required.		
RC-B	Remote control adaptor to be used in conjunction with external devices such as lights, background music, etc.	1 for each zone where external device is located.		

Note: System may include total of four MC-A and/or RC-B.

V. Installation Guidelines

BE SURE TO TURN OFF RAX POWER SUPPLY BEFORE YOU OPEN THE UNIT OR MAKE WIRING CONNECTIONS.

1. Central Exchange Unit (CEU);

* Select location for CEU that will facilitate ease of access to the unit itself.

* Plug the power supply into a clear line. Interference on the power line may cause function error.

* Select a location that:

    — has low humidity.

    — is free of dust.

    — is vibration free.

    — is free of static electricity.

    — is not near flammable or chemical product.

    — is not close to high voltage equipment.

    — is not within a strong magnetic field.

    — is not near heating or air conditioning outlets or equipment.

    — does not have direct sunlight.

    — does not have temperature extremes: below $0°C$ ($+32°F$) or above $+40°C$ ($+104°F$).

2. Station;

* Each station must be home run wired to the C.E.U. individually, and must have individual station numbers.

* Follow location guidelines for the Central Exchange Unit when selecting station location.

* Avoid locations where temperature dips below $-10°C$ ($+14°F$) or exceeds $+60°C$ ($+140°F$).

* Select a most suitable type of station according to your communication requirements and environmental conditions.

3. Wiring;

* Use 2 twisted pairs for each station.

* Keep twisted pair cable well apart (over 50 cm or 20″) from other cables such as heavy duty power lines, telephone lines and/or paging amplifier output line (speak line).

4. Installation;

* In new construction install single-gang box for RA-A or RA-D stations or electrical box (see page 14) where RA-B or RA-C stations are to be wall-mounted. The station will cover the hole, when installed.

VI. Wiring

There are two basic wiring methods for RAX system.

In either case, you must use two twisted pair per station.

METHOD 1: 2 twisted pair in home run manner from each station to RAX Central Exchange Unit.

METHOD 2: More than one station can be run in multiple twisted pair cable.
DO NOT RUN SPEAKER LINE IN MULTIPLE PAIR CABLE FOR STATIONS.

* A combination of the above methods may also be used.

Refer to the chart below and select wire gauge required for your installation;

Wire size	0.5 mm	0.65 mm	0.8 mm	24AWG	22AWG	20AWG
Max. wiring distance from station to RAX CEU	350 m	600 m	900 m	1,200'	2,000'	3,000'

PAGING/REMOTE CONTROL

The RAX system has the capacity of paging up to four separate zones and All Page.

Each zone requires one paging adaptor Model: MC-A, one amplifier and proper number of speakers for the amplifier output (and one PB-YKX talkback paging adaptor is required for talkback). NOTE: All Page is a system function and does not require special equipment or wiring.

NOTES: 1. If the system includes a remote control device, one paging terminal must be used for the RC-B remote control adaptor. This will reduce the number of paging zones to 3.

2. Adding zones of paging and/or remote control does not reduce the station capacity of the system (i.e. a 24-station system may have 24 stations plus 4 zones of paging and/or remote control).

3. If an RC-A adaptor is installed for each zone, only one MC-A paging adaptor and one amplifier is required for zone page/All Page. Talkback will require one PB-YKX talkback adaptor.

WIRING REQUIRED

* 2 twisted pair cable or multiple twisted conductor cable may be used for connecting station to RAX terminal board . . . . . . Wiring is polarized in each twisted pair. These cables must be twisted pair.

* Connection to MC-A adaptor requires two common plus one individual conductors from CEU terminal board.

* Regulator unit in CEU must be earth grounded.

* Do not run speaker line in the same cable with station wires.

RAX SYSTEM DIAGRAM AND WIRING EXAMPLE

RAX Central
Excharge Unit
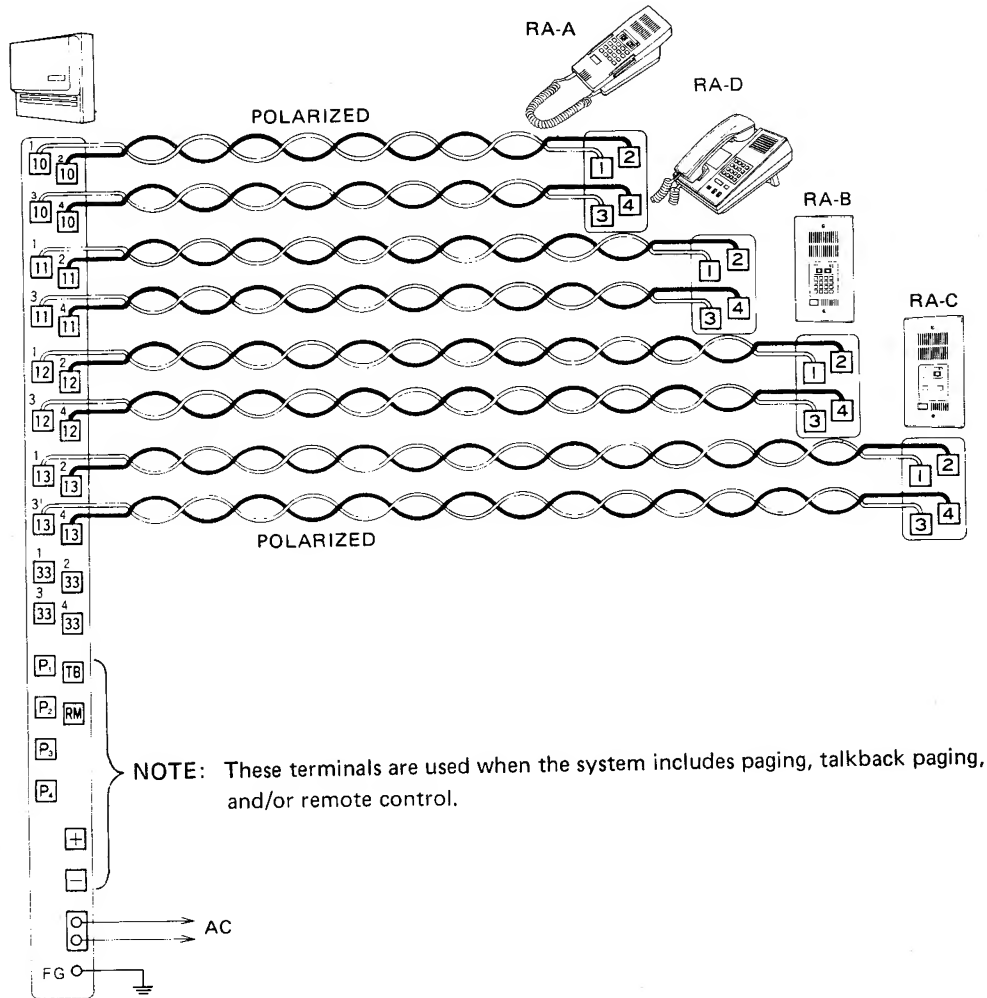
In case you want to include RA-C sub station in your RAX system, the RA-C station number must be assigned in consecutive numerical sequence, either the number before or after the number of the master station, such as $\boxed{10}$ — $\boxed{11}$, $\boxed{12}$ — $\boxed{13}$ ... $\boxed{32}$ — $\boxed{33}$.

Example: When RA-C sub station is connected to terminal No. 10 and RA-A (RA-D or RA-B) master station is connected to terminal No. 11, pressing $\boxed{\blacktriangleright}$ on RA-C station No. 10 calls master station No. 11 or vice versa. Any other station may call the RA-C station No.10 by pressing $\boxed{1}$, $\boxed{0}$.

NOTE: 1. The lower number in a pair of stations must be an even number, such as $\boxed{10}$ — $\boxed{11}$, ... $\boxed{18}$ — $\boxed{19}$ ... $\boxed{24}$ — $\boxed{25}$.

2. To make a pair of master/sub, master station may be connected to either station number in a pair, lower or higher, as shown below;

Example:	10	11	
	RA-A	RA-C	Either combination will be acceptable for master/
	RA-C	RA-A	sub communication between Station No. 10 and 11.

VII. RAX System Installation

(A) Mounting Central Exchange Equipment

* **Be sure to turn off the power switch on the RAX C.E.U. before you open the unit OR make wiring connections.**

** **The location of Central Exchange Equipment must meet the following criteria;**

1. Ambient temperature range: 0°C to +40°C (+32°F to +104°F).
2. Area must be as dust free as possible, and not too dry or too humid.
3. Units must be wall mounted.
4. Avoid static electricity.

There are two basic methods (shown below) of mounting equipment.

If the adaptor(s) and amplifier(s) must be located in an area exposed to people, use of a cabinet is recommended to reduce the possibility of someone changing level controls, or damaging wiring.
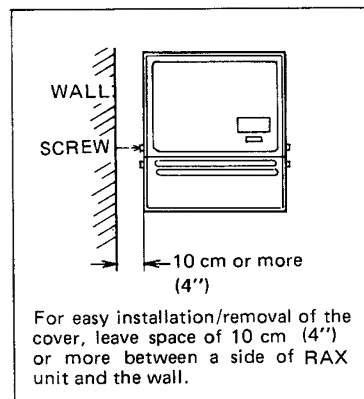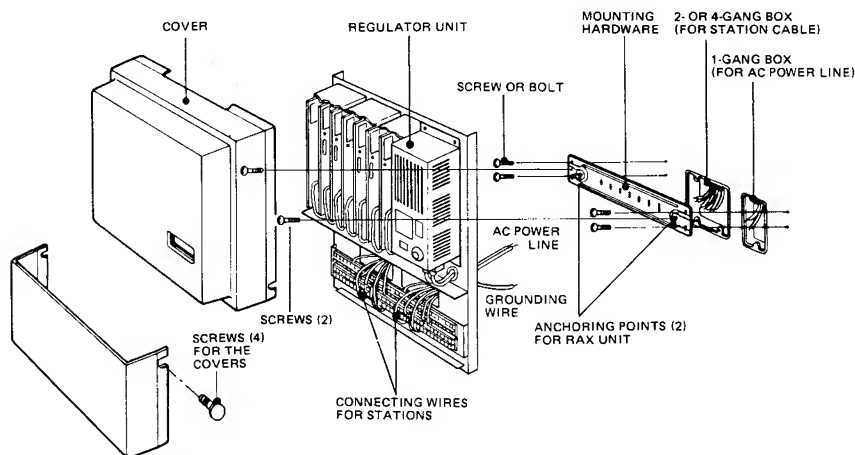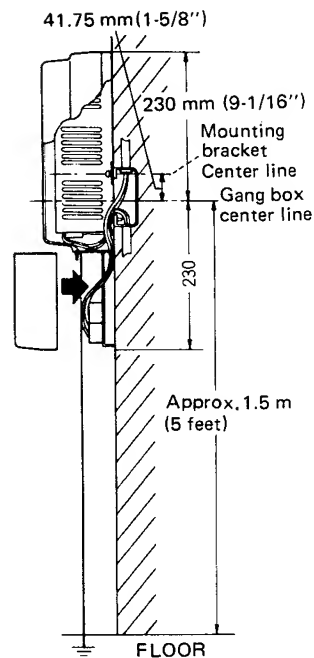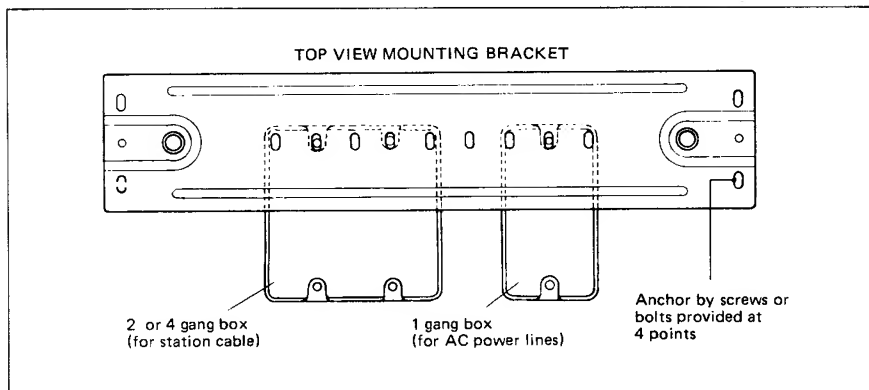
It is recommended that the Central Exchange Unit not be installed inside of the cabinet, which could restrict ventilation.

If the equipment is to be installed in an electrical room or cabinet, it is recommended that a piece of 1.2 cm (1/2") plywood of adequate size be secured to the wall first and equipment then mounted to the plywood. This will insure adequate backing for mounting screws, incoming cable distribution, and tie down.
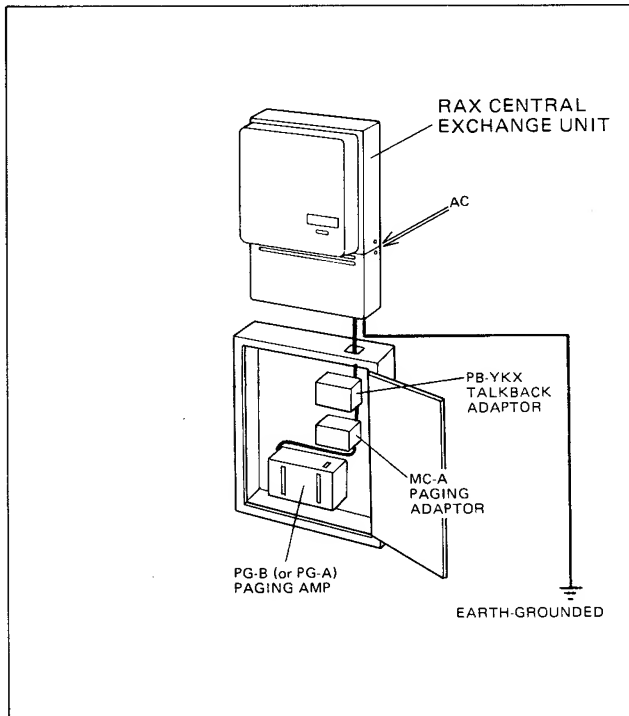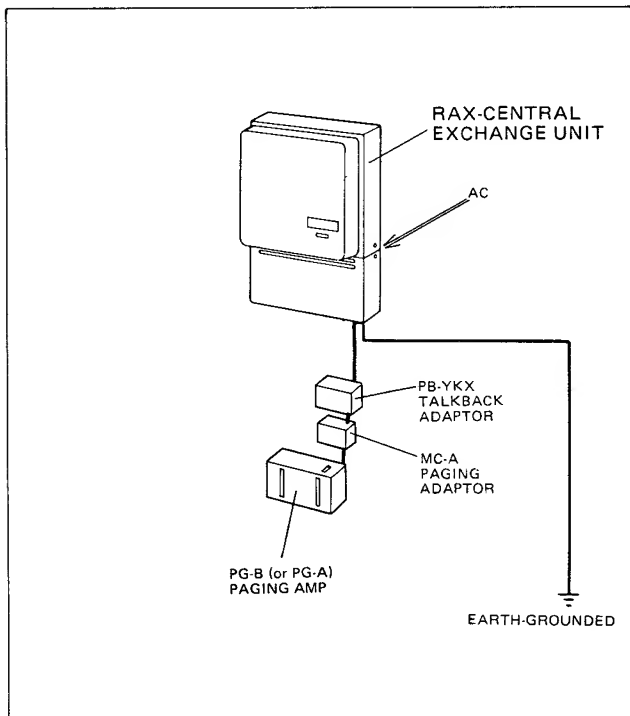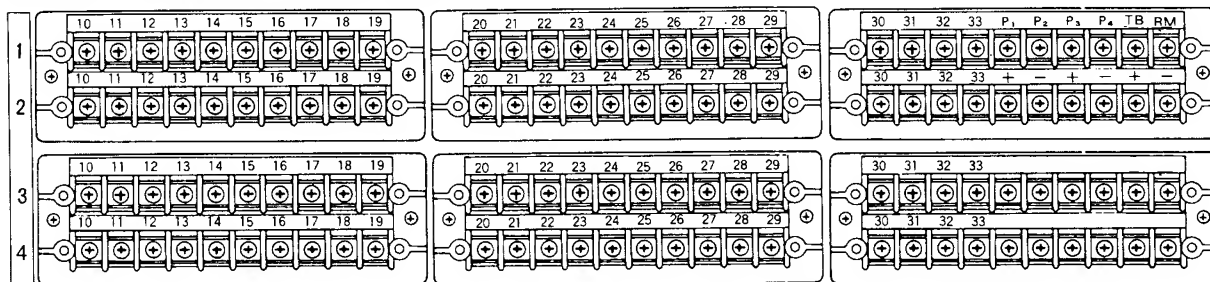
(B) RAX Central Exchange Unit Mounting Instructions

1. Central Exchange Unit shall be wall mounted approximately 1.5 m (5 feet) high from the floor.

2. Install the mounting bracket to the gang boxes with the provided screws.
   Anchor the bracket with the provided screws or bolts at 4 points.

3. Mount the RAX Central Exchange Unit onto the bracket, and connect wires for both stations and AC power line.

4. Replace the covers.

41.75 mm (1-5/8")

230 mm (9-1/16")

Mounting bracket Center line

Gang box center line

230

Approx. 1.5 m (5 feet)

FLOOR

TOP VIEW MOUNTING BRACKET

2 or 4 gang box (for station cable)

1 gang box (for AC power lines)

Anchor by screws or bolts provided at 4 points

COVER

REGULATOR UNIT

SCREW OR BOLT

MOUNTING HARDWARE

2- OR 4-GANG BOX (FOR STATION CABLE)

1-GANG BOX (FOR AC POWER LINE)

AC POWER LINE

GROUNDING WIRE

ANCHORING POINTS (2) FOR RAX UNIT

SCREWS (2)

SCREWS (4) FOR THE COVERS

CONNECTING WIRES FOR STATIONS

WALL

SCREW

10 cm or more (4")

For easy installation/removal of the cover, leave space of 10 cm (4") or more between a side of RAX unit and the wall.

RAX-24 TERMINAL LOCATIONS

10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	P₁	P₂	P₃	P₄	TB	RM

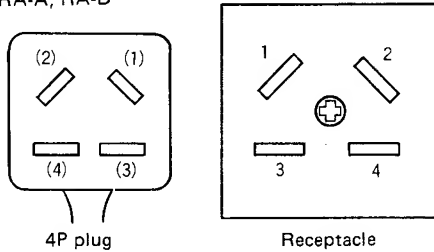| 10 — 33 | Intercom station terminals | TB , RM | Remote control output terminals |
| P_1 , P_2 , P_3 , P_4 | Paging/remote control terminals | $+$, $-$ | Power terminals for paging. |

NOTES: (1) Intercom station terminals on each Central Exchange Unit are;

10 — 17 in RAX-8
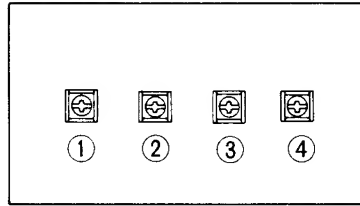10 — 25 in RAX-16
10 — 33 in RAX-24

(2) The number terminals 10 — 11 , 12 — 13 , 14 — 15 ... and up to 32 — 33 can be used as 'pair terminals' of master/sub.

—11—

(C) Connecting Station Unit

RA-A, RA-D

RA-B/RA-C


```
(2)        (1)
 2P plug
(4)        (3)
```

4P plug

```
  1          2


  3          4
```

Receptacle

$\boxed{1}$, $\boxed{2}$, $\boxed{3}$, $\boxed{4}$: Connect to each number
terminal assigned on the
Terminal section of
RAX CEU.

* 4P plug . . . . Plug into the receptacle.
* Receptacle . . . . . . Connect to Terminal section
  of the Central Exchange Unit.
* $\boxed{1}$, $\boxed{2}$, $\boxed{3}$, $\boxed{4}$ Connect to each number terminal
  assigned on the Terminal section
  of the Central Exchange Unit.

(D) RA-A Wall Mounting Installation

1. Unscrew the RA-A pedestal base and separate the cover from the chassis.
2. Reversely replace the cover to the chassis and mount the RA-A pedestal base to one-gang box with cover or to wall with the provided screws.


Screw x 2   RA-A Pedestal base

One-gang box with cover
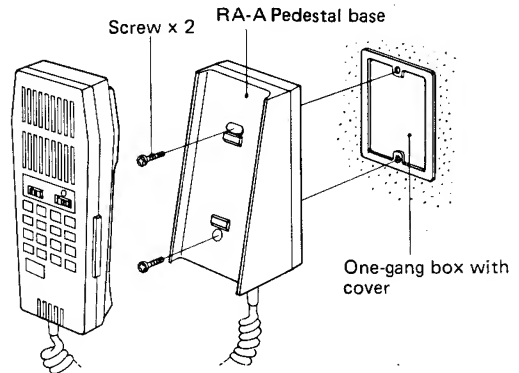
(E) RA-D Mounting Installation

For desk top use;
As shown, just insert the stand and fix with a screw provided.

stand

stand
Insert here
Screw (supplied)
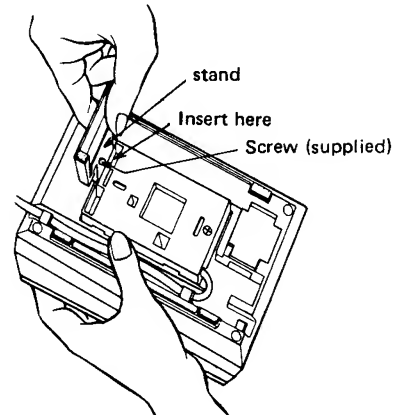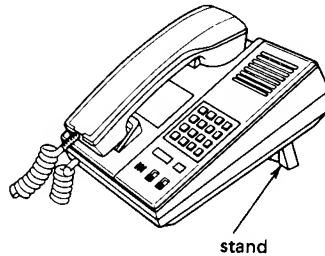
For wall mounting;
RA-D is primarily designed for desk top use, but may practically be used for wall mount (surface mount).
Remove a screw fixing terminal board. Slide down terminal board, pull off 4P connector and separate terminal cord from the chassis.
Attach terminal board to the wall with two screws. As shown, pull out terminal cord either from top or bottom of the unit. Attach connector and fit the unit onto the terminal board.

Connector (male)
Connector (female)
Screw x 2
Terminal board

RA-D body
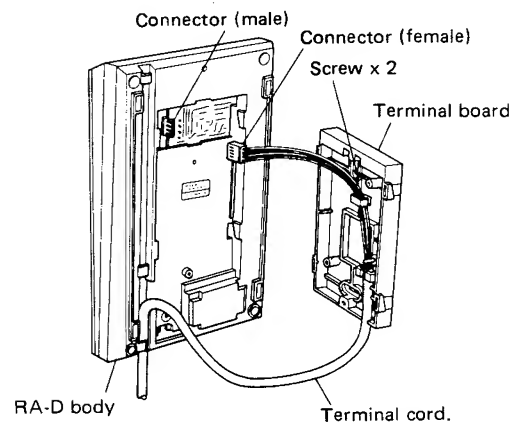
Terminal cord.

Receptacle installation

RA-A' and RA-D have terminal cord of 2 m long (6-1/2"), male plug and shipped complete with female receptacle. When desk mounting where cable must be run surface on the wall, fix the female receptacle to proper location and just plug in the male plug.
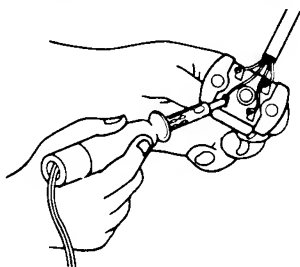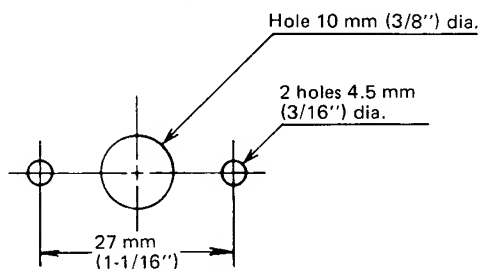
1. Mount the receptacle to wall as shown below;
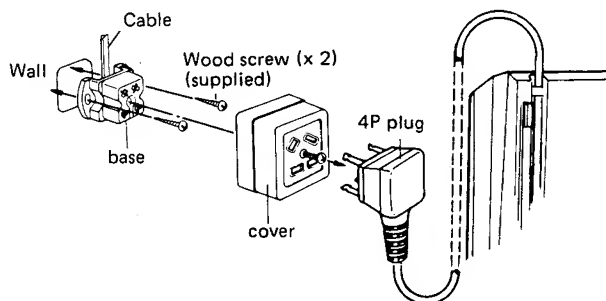
2. When mounting the receptacle to flush plate, drill three holes on the flush plate and attach the receptacle with the screws provided. Be careful not to install receptacle base upside down.
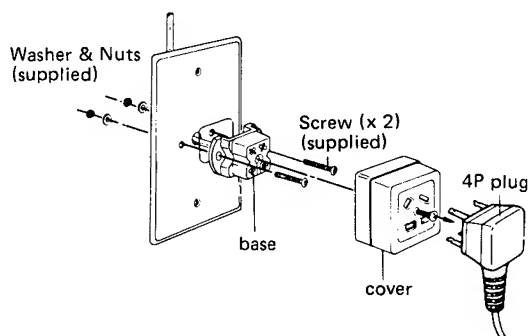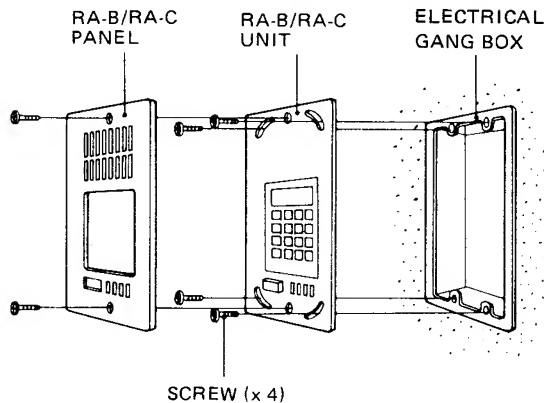

■ **Connecting wires on receptacle base**


■ **Drilling holes on flush plate**

Hole 10 mm (3/8") dia.

2 holes 4.5 mm (3/16") dia.

27 mm (1-1/16")

(F) RA-B and RA-C Flush Mount Installation

RA-B/RA-C PANEL   RA-B/RA-C UNIT   ELECTRICAL GANG BOX

SCREW (x 4)

1. Separate the RA-B/RA-C panel from the RA-B/RA-C unit.
2. Attach the RA-B/RA-C unit to electrical box with the supplied screws.
3. Replace the RA-B/RA-C panel to the unit with the 2 screws.

In N. America, please specify either BOWERS 703-SPL, RACO 952, APPLETON 3G-5075 or equivalent.

RA-B/RA-C FLUSH-MOUNTING GUIDE
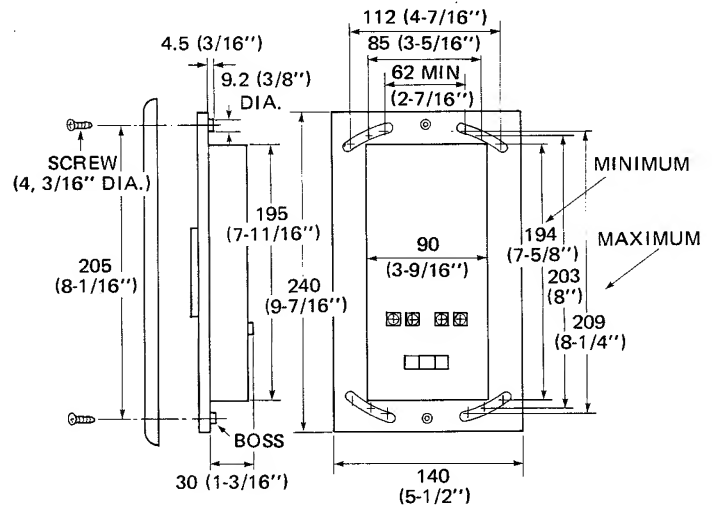
RA-B/RA-C SIDE & BACK VIEW

When RA-B/RA-C are fulsh-mounted to wall, be sure that two holes be opened for the bosses of 9.2 (3/8″) diameter and protruding 4.5 mm (3/16″).

Notes on installing station units;
(1) Avoid to locate the station unit in such places as closely surrounded by wall or other things, which may interfere with voice-switching to function properly.
(2) Keep the station unit away from the paging speakers to avoid acoustic feedback in paging mode.

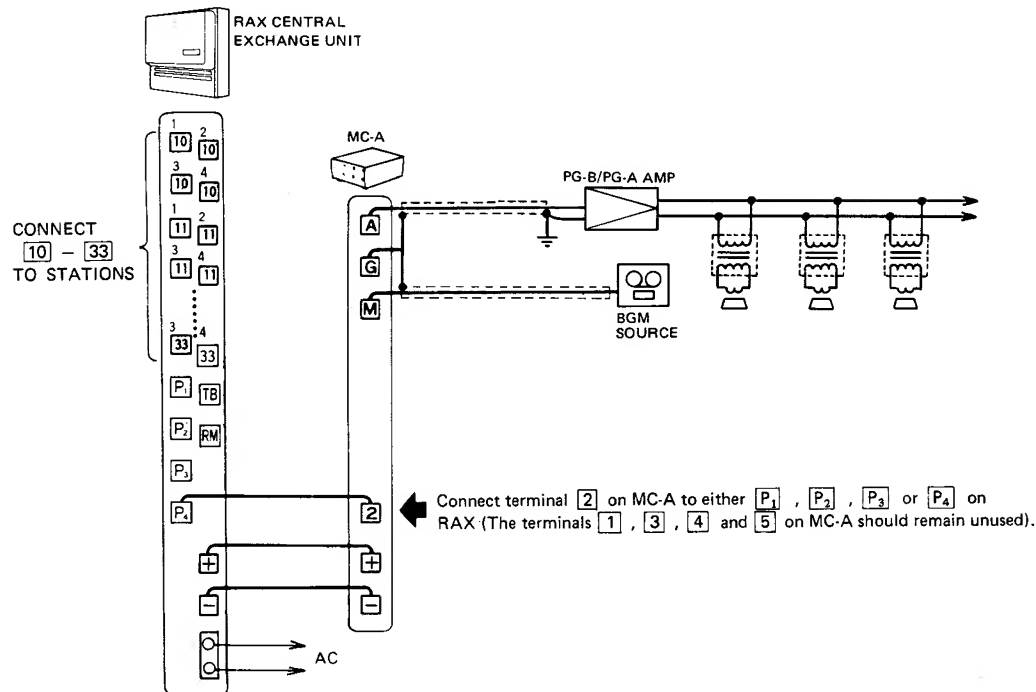## (G) Connecting AC Power Line and Grounding Wire

RAX-8, RAX-16, RAX-24
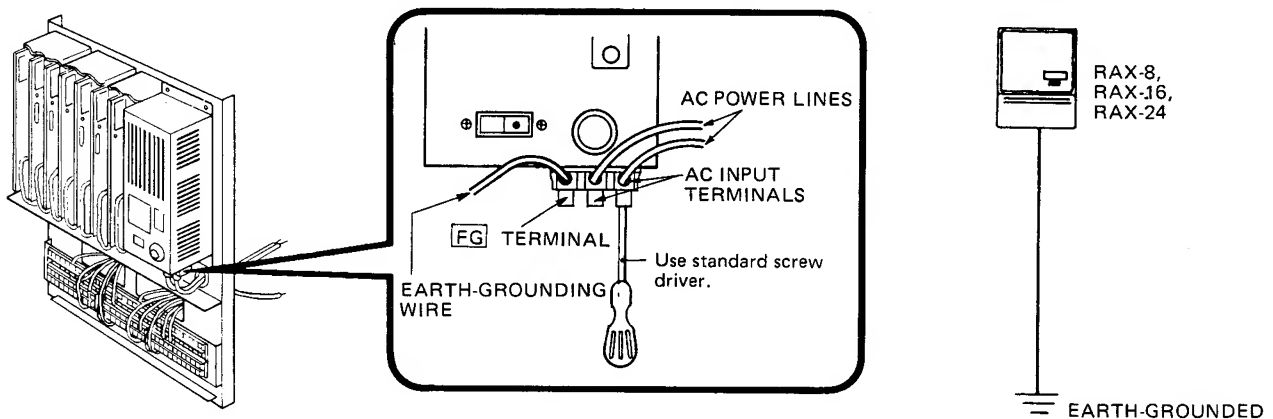
EARTH-GROUNDED

As shown using standard screw driver, connect AC power line to AC INPUT terminals, and earth-ground wire to FG terminal.
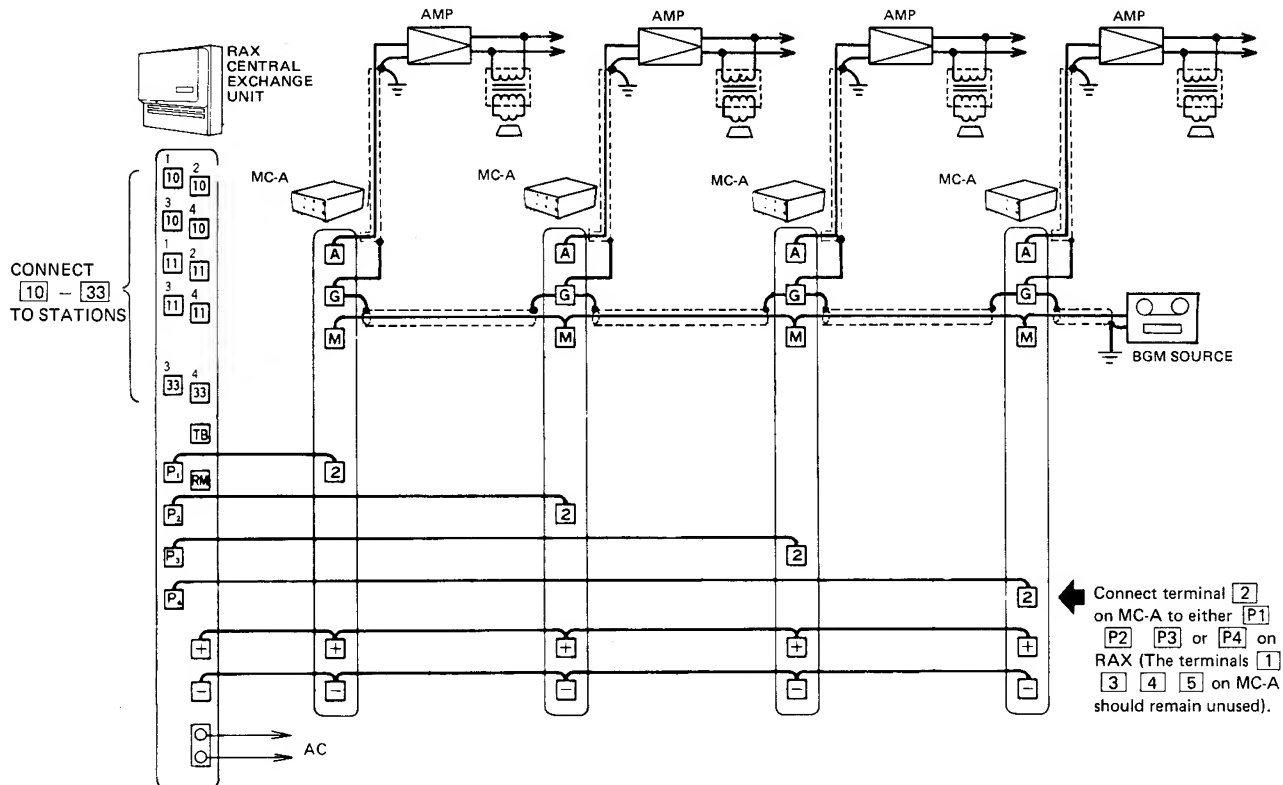
(H) Connecting Paging Equipment
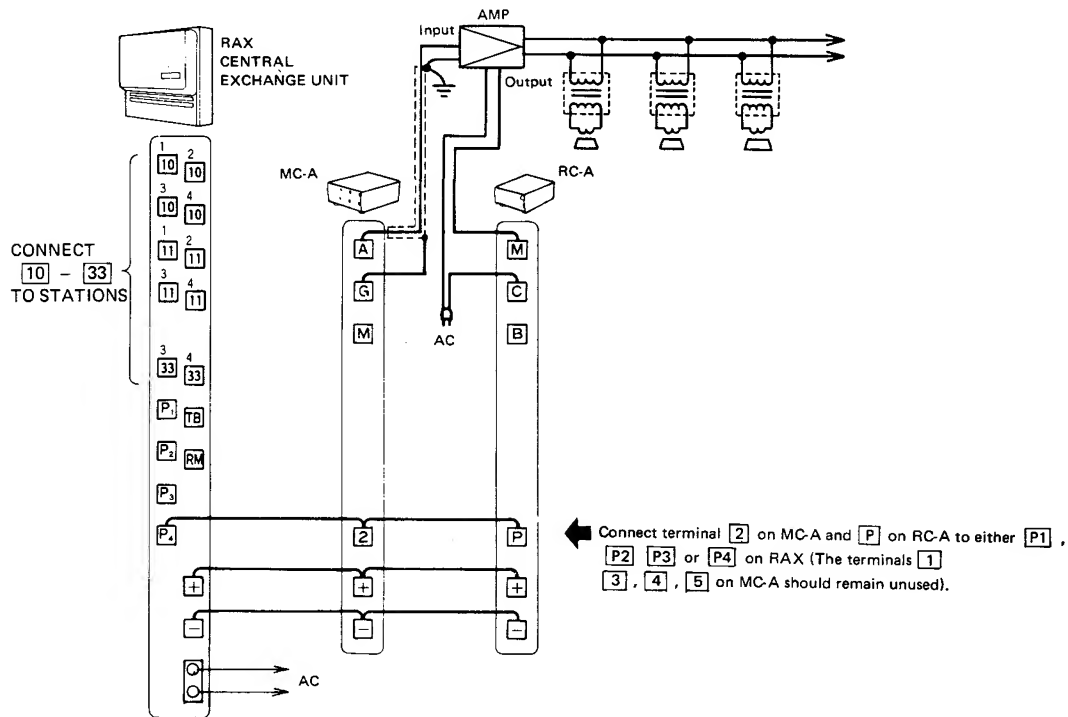## PAGING — ZONE PAGE APPLICATION WITHOUT TALKBACK

① PAGING TO ONE ZONE (WITH BACKGROUND MUSIC)

Connect terminal ② on MC-A to either P₁ , P₂ , P₃ or P₄ on
RAX (The terminals ① , ③ , ④ and ⑤ on MC-A should remain unused).

② PAGING TO 4 ZONES (WITH BACKGROUND MUSIC)

Connect terminal ②
on MC-A to either P1
P2 P3 or P4 on
RAX (The terminals ①
③ ④ ⑤ on MC-A
should remain unused).

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③ PAGING TO ONE ZONE, WITH REMOTE OPERATION OF POWERING AMPLIFIER ON WHEN PAGING, USING RC-A ADAPTOR

Connect terminal 2 on MC-A and P on RC-A to either P1, P2 P3 or P4 on RAX (The terminals 1 3, 4, 5 on MC-A should remain unused).
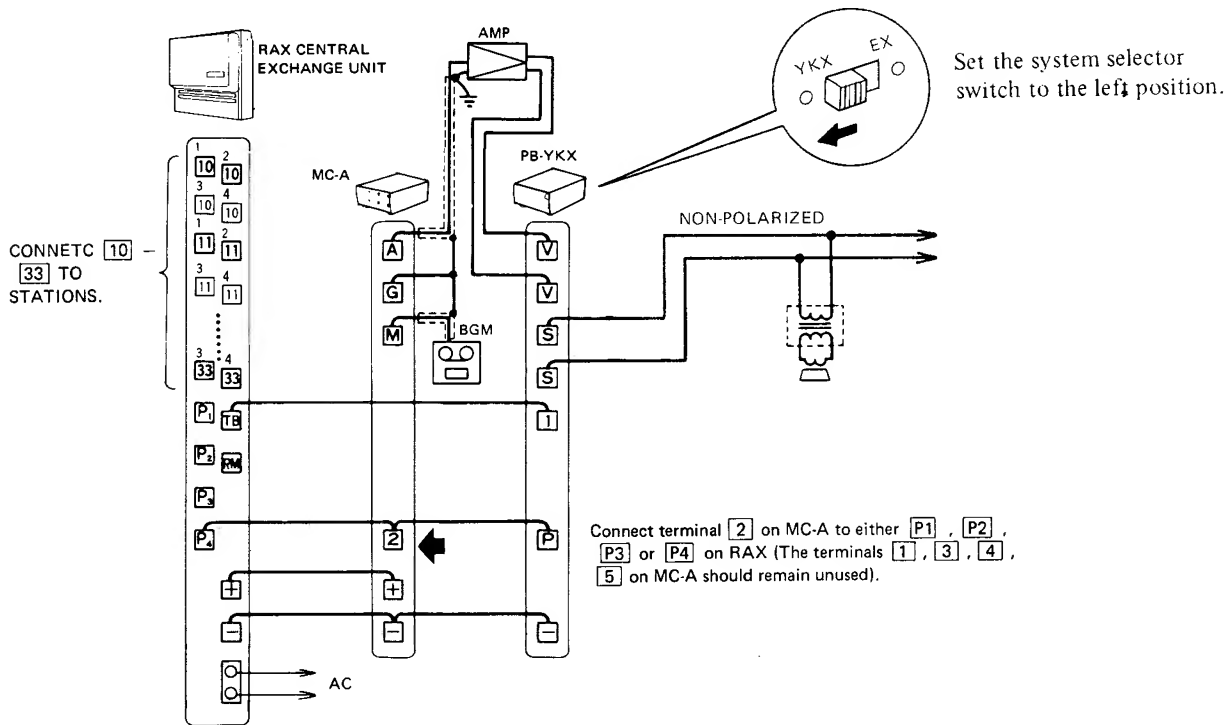
④ PAGING TO 4 ZONES, OR ALL PAGE, WITH ONE AMPLIFIER USING RC-A ADAPTOR (WITHOUT BACKGROUND MUSIC)

Notes: 1. RC-A adaptors must be located close to the RAX Central Exchange Unit.
2. The MC-A VOLUME CONTROL adjusts level of paging volume for 4 zones.
3. Output power of paging amp. must be sufficient to operate four paging zones simultaneously (All page).
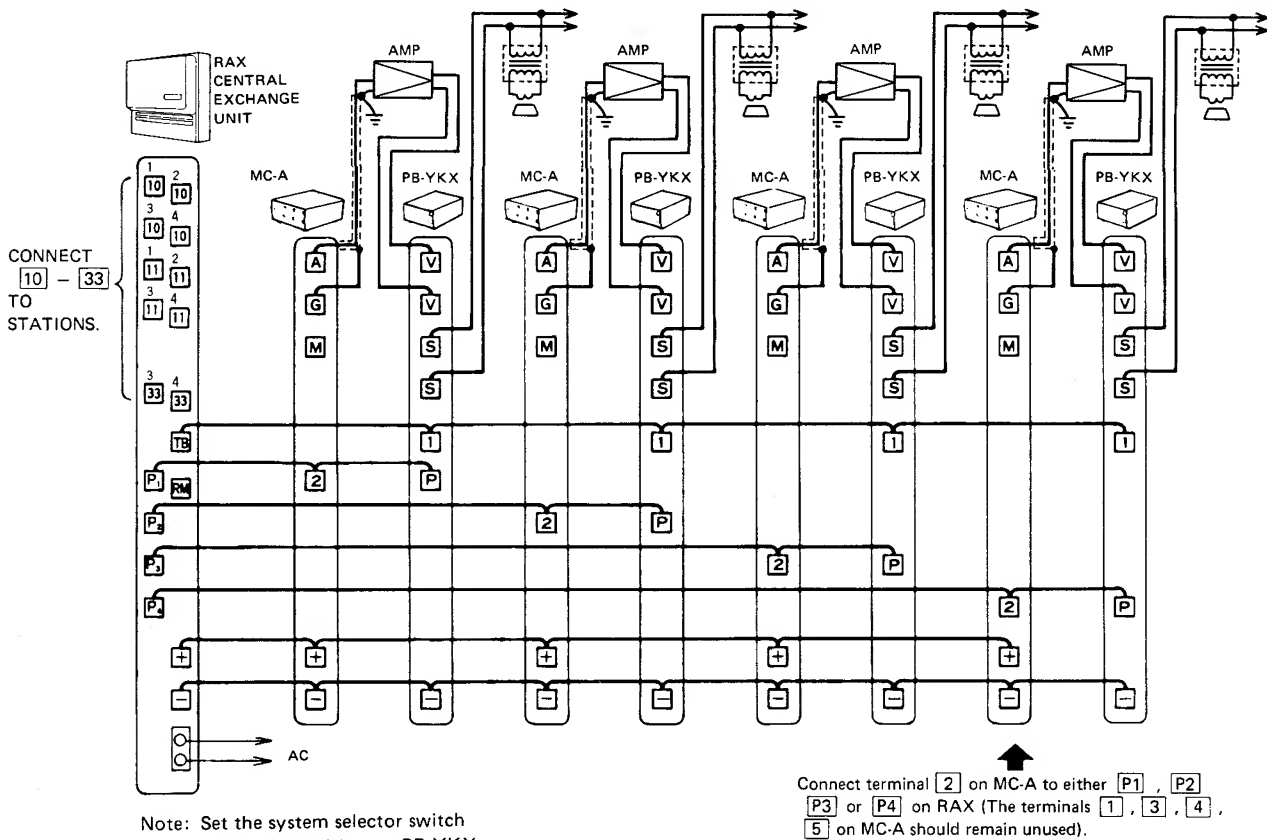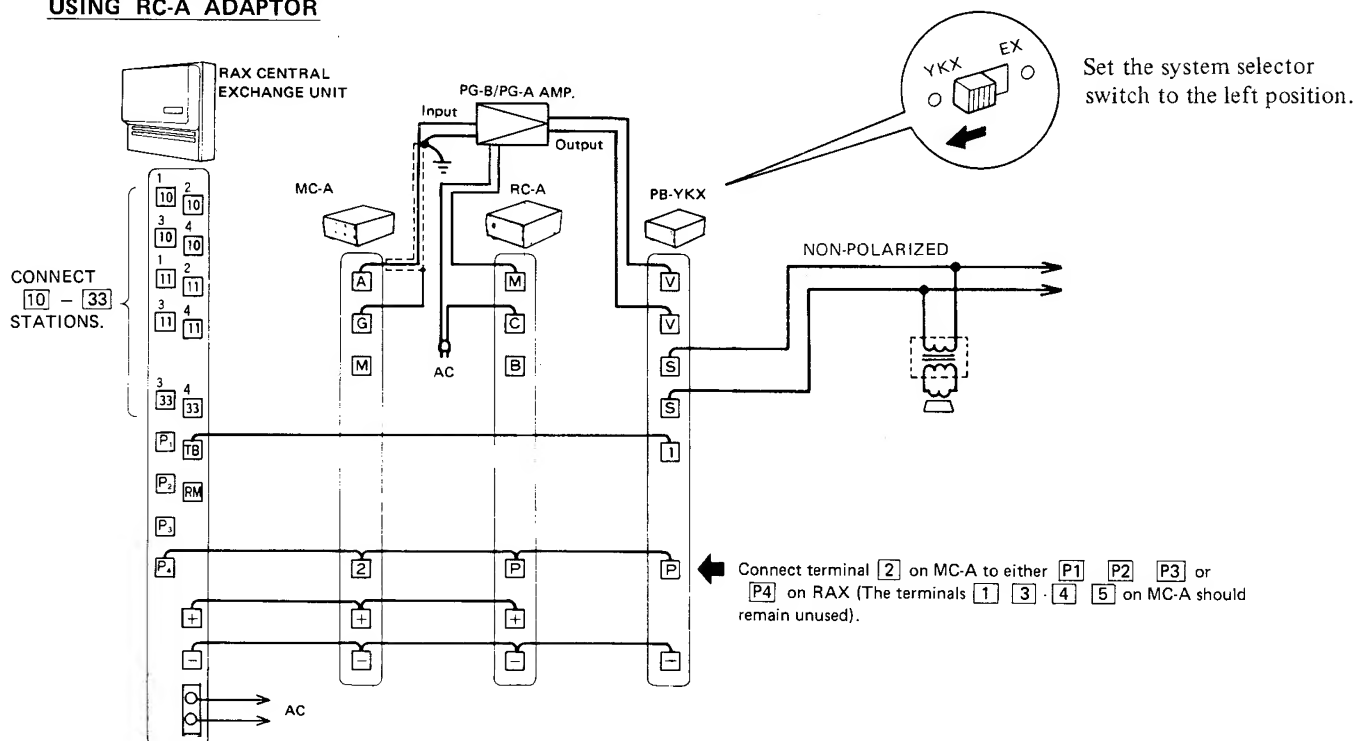

*SILICON DIODE (x 4)
forward current 100mA
reverse voltage 35V or more
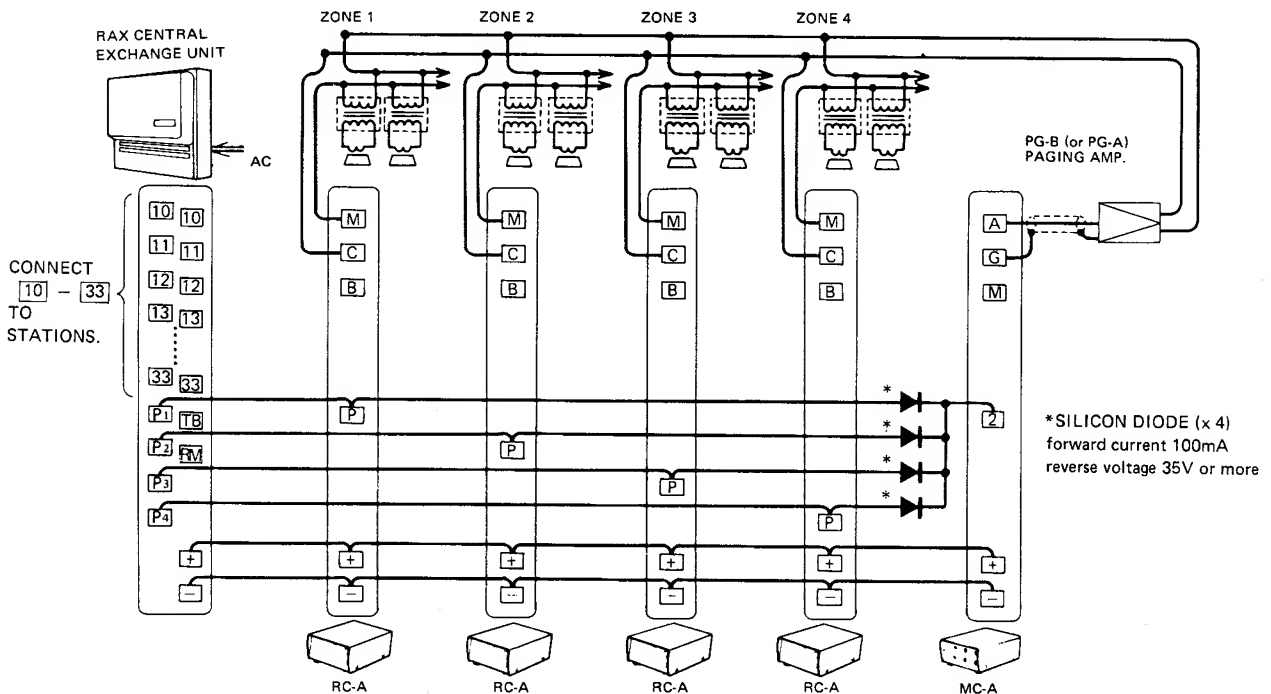
(I) Connecting Talkback Paging Equipment

① PAGING TO ONE ZONE WITH TALKBACK (WITH BACKGROUND MUSIC)

Set the system selector switch to the left position.

CONNETC [10] – [33] TO STATIONS.

Connect terminal [2] on MC-A to either [P1], [P2], [P3] or [P4] on RAX (The terminals [1], [3], [4], [5] on MC-A should remain unused).

② PAGING TO 4 ZONES WITH TALKBACK (WITHOUT BACKGROUND MUSIC)

CONNECT [10] – [33] TO STATIONS.

Connect terminal [2] on MC-A to either [P1], [P2], [P3] or [P4] on RAX (The terminals [1], [3], [4], [5] on MC-A should remain unused).

Note: Set the system selector switch to the left position on PB-YKX.

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③ TALKBACK PAGING BY REMOTE OPERATION OF POWERING AMPLIFIER ON WHEN PAGING, USING RC-A ADAPTOR

Set the system selector switch to the left position.

Connect terminal [2] on MC-A to either [P1] [P2] [P3] or [P4] on RAX (The terminals [1] [3] · [4] [5] on MC-A should remain unused).
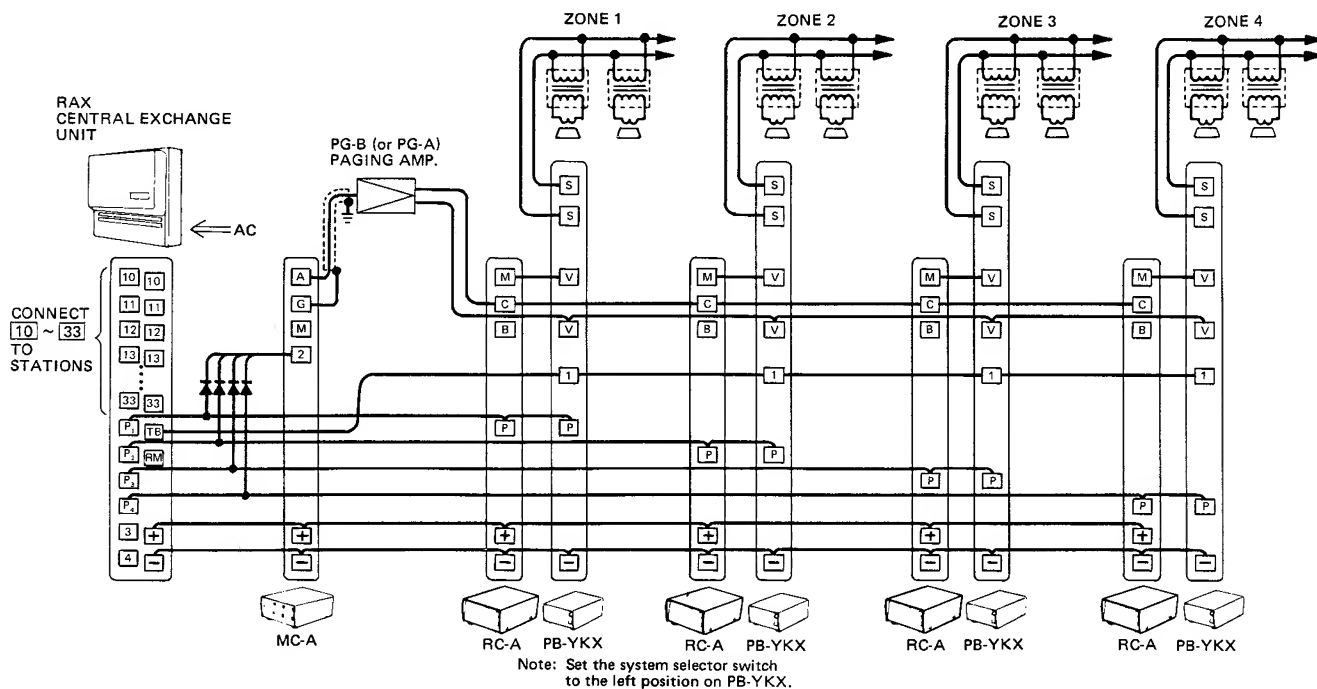
④ PAGING TO 4 ZONES WITH TALKBACK, WITH ONE AMPLIFIER USING RC-A ADAPTOR
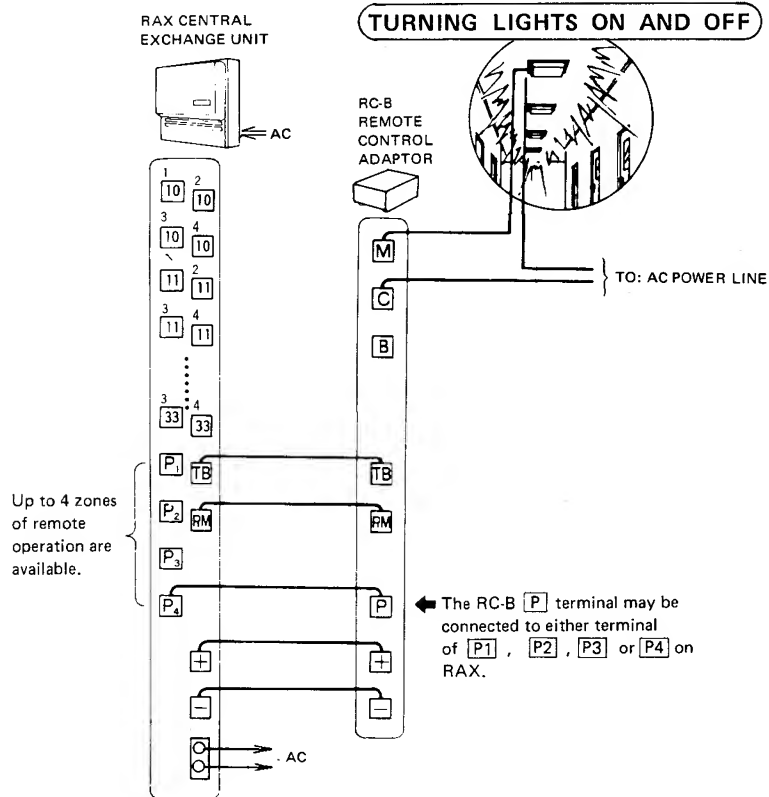
Notes: 1. Talkback is not possible in All Page mode.
2. Output power of paging amplifier must be sufficient to operate 4 paging zones simultaneously (All Page).
3. Such paging accessories as RC-A's MC-A and PB-YKX must be installed close to central Exchange Unit.
4. Install a silicon diode (forward current: 100 mA, reverse voltage: 35V or more) between [2] on MC-A and [P1~4] on RAX CEU.

Note: Set the system selector switch to the left position on PB-YKX.

(J) Connecting Remote Control Equipment, using the RC-B adaptor

RAX CENTRAL EXCHANGE UNIT

RC-B REMOTE CONTROL ADAPTOR

TURNING LIGHTS ON AND OFF

Up to 4 zones of remote operation are available.

TO: AC POWER LINE

The RC-B [P] terminal may be connected to either terminal of [P1], [P2], [P3] or [P4] on RAX.

NOTES:

(1) Wiring method is the same for either momentary or alternate operation, except for setting the selector switch as below.

(2) When the RAX power supply is turned off, the entire system becomes inoperative, including remote operations.

(3) One remote control reduces one paging zone.

METHOD #1 ALTERNATE OPERATION

Example: Turning lights ON and OFF

Operation:
1. Pick up handset.
2. Press [∷] (PAGE) button and zone number button ([1], [2], [3] or [4]).
3. Momentarily depress [↕] (TALK) button. If you hear continuous tone, it means lights are in OFF position. If you hear intermittent tone, the lights are ON.
4. Momentarily depress [0] button, to reverse ON/OFF mode. Press [•] (OFF) button or hang up handset in RA-D.

NOTE: Remote control continues to be working, if handset is hung up when remote control is in operating mode (in alternate operation)

METHOD #2 MOMENTARY OPERATION

Example: Opening electric door release.

Operation:
1. Pick up handset.
2. Press [∷] (PAGE) button and zone number button ([1], [2], [3] or [4]).
3. Momentarily depress [↕] (TALK) button. You will hear a continuous tone through handset (door release is not activated).
4. Press and hold [0] button down, and electric door release is activated. Door will open. Press [•] (OFF) button or hang up handset in RA-D.

SELECTOR SWITCH=UPPER POSITION for ALTERNATE OPERATION

SELECTOR SWITCH=LOWER POSITION for MOMENTARY OPERATION

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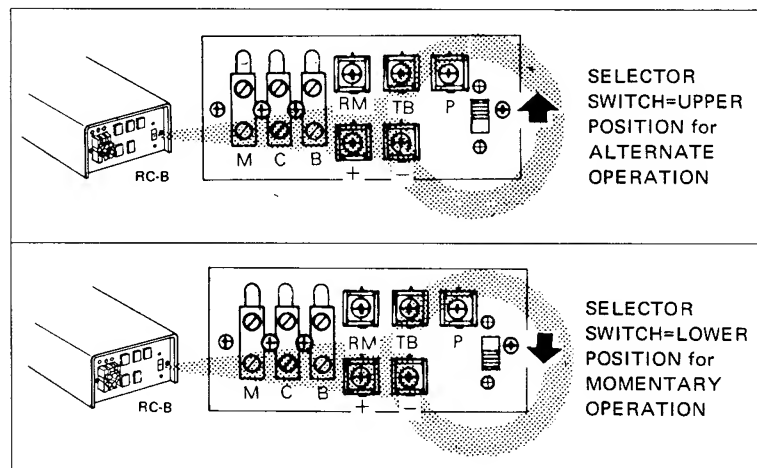
(K) All Call

All call means that user can page through all stations instead of separate paging speakers.

Note: All call has the top priority over other functions and overrides existing conversations and/or stations in privacy mode/ secretary transfer mode.

OPERATIONS

1. Calling & Communication (RA-A, RA-B & RA-D)

Press two-digit buttons of desired station (i.e. [1] , [0] for station #10).

Note: Station numbers available: from [10] to [17] for RAX-8 system
from [10] to [25] for RAX-16 system
from [10] to [33] for RAX-24 system

The line is established when a short tone sounds as well as call LED gets illuminated, and talk handsfree. After communication, press [●] (OFF) button.

When Busy Tone is heard; Short intermittent tone means called station is occupied.
You may press [●] button or hang up handset in RA-D to disconnect OR press [⊙] (MEMORY) button to leave request for automatic call back. You will be automatically connected as soon as called station completes its conversation.

If your message is urgent; You may break in on the called station's conversation by pressing [0] button. Called **(Urgent Message or Break-in)** station will receive signal and place present conversation on HOLD to reply.

When Privacy Tone is heard; Longer intermittent tone indicates called station is in Privacy Mode. You may wait for station to release from Privacy Mode, as call tone will signal at the station in Privacy Mode for about 4 seconds.

2. Rceiving a call (RA-A, RA-B, RA-D & RA-C)

An incoming call is annunciated by a short tone and call LED illumination.
Reply hands free.
In RA-A you may pick up the unit and depress and hold the bar switch and in RA-D, pick up handset for private handset communication. After communication, press the [●] (OFF) button or hang up handset in RA-D.

Urgent Message Break-in Signal; A short tone, like the call tone, received during a conversation indicates another station is trying to reach you with an urgent message.
Press [⊙] (MEMORY) button to place present call on HOLD and automatically connect you to the calling station.
Touch [●] (OFF) button or hang up handset in RA-D to restore connection to station on HOLD and resume conversation.

Privacy
To block out incoming calls and prevent monitoring, slide PRIVACY SWITCH to the right position.
An incoming call is announciated by longer intermittent tone signalling about 4 seconds. Press [▸◂] (TEMPORARY PRIVACY) button to reply hands free or, in RA-A, pick up the unit and hold the bar switch or, in RA-D, pick up handset to reply. After communication press [●] (OFF) button or hang up handset in RA-D and the station automatically returns to PRIVACY mode.

To release from Privacy Mode, slide PRIVACY SWITCH to the left position.

* Setting or releasing from Privacy Mode must be made while your station is in standby mode.

3. Call Transfer;

To transfer a call from one station to another, press ⊙ (MEMORY), number of station where call is to be transferred and, after communication line is established, press ⑦ (TRANSFER) button.

4. Call Holding;

To place present communication on HOLD, press ⊙ (MEMORY) button. Press ⊙ (MEMORY) button or ● (OFF) button or hang up handset in RA-D to restore connection to station on HOLD and resume conversation.

5. Secretary Transfer;

Press ⊙ (MEMORY) button and station number buttons to have your calls answered in your absence by your secretary or another person you want to receive your calls. → Call LED flickers.

Press ⓪ (CLEAR) and ⑦ (TRANSFER) buttons to cancel secretary transfer mode.

6. Press-to-Talk Operation;

When you communicate with a station situated in a noisy area, you may press ↕ (TALK) button to talk and release to listen.

7. Master/Sub Communication;

For communication between a paired master & sub stations, press ► button to call and communicate as soon as the line is established.

After communication, press ● (OFF) button at either station or hang up handset in RA-D.

8. All Page;

To page all zones in your system through speakers, press ⠿ (PAGE) button and ⑨ (ALL PAGE) button, then depress and hold ↕ (TALK) button and page. TALKBACK IS NOT AVAILABLE IN ALL PAGE MODE. The paged person may reply to the paging person from nearest station by pressing ⑥ button.

Press ● (OFF) button or hang up handset in RA-D when page message is completed.

9. Zone Page;

To page one selected zone in your system through speakers, press ⠿ (PAGE) and zone number (①, ②, ③ or ④) buttons, then depress and hold down ↕ (TALK) button and page.

When talkback is included, release ↕ (TALK) button for reply.
When talkback is not included, the paged person any reply from the nearest station by pressing ⑥ button.

10. All Call;

To page through individual stations, press ⑤ and make announcement by depressing and holding ↕ (TALK) button.

The person paged can go to the nearest station, press ⑤ button and can reply to the All Call.

The All Call Call-back Automatic Connection is valid for about 30 second, after the announcement is completed.

*Operational notes:
(1) For handset communication, hold the RA-A bottom side to your ear and keep the bar switch in depressed position.
(2) Communication should be made within an operable distance.
    In RA-A, talk toward the microphone from the front for best results.
(3) Do not put papers or books near RA-A and RA-D units to ensure best performance.
(4) In RA-D, TALK button in handset works for ↕ (TALK) button on the dial key pad.

VIII. RAX System Specifications

1. Central Exchange Unit: RAX-8, RAX-16, RAX-24

* Power source	AC110-125V, AC220-240V, 50/60Hz.
* Power consumption	Maximum 68W, 23W in standby mode (RAX-24)
	Maximum 50W, 20W in standby mode (RAX-16)
	Maximum 35W, 18W in standby mode (RAX-8)
* Station capacity	8 in RAX-8, 16 in RAX-16, 24 in RAX-24
* Trunkage capacity	2 channels for communication and one separate channel for paging/remote control.
* Dialing	Mono frequency-duty modulation
* Line scanning	Voltage level detection by time sharing
* Internal network	PAM time sharing multi-network
* Line impedance	600 ohm
* Permitted line resistance	64 ohm (Loop)
* Wiring	Home run CEU — RA-A . . . . . . 2 twisted pairs
	CEU — RA-B . . . . . . 2 twisted pairs
	CEU — RA-D . . . . 2 twisted pairs
	CEU — RA-C . . . . . . 2 twisted pairs
	CEU — MC-A . . . . . . 3 wires
	CEU — PB-YKX . . . . 3 wires
	CEU — RC-A . . . . . . 3 wires
	CEU — RC-B . . . . . . 5 wires
* Ambient temperature	$0°C (+32°F) \sim 40°C (+104°F)$
* Ambient humidity	Under 80% (yearly average)
* Installation	Wall mount (including terminal board, power supply unit).

2. Open voice station, with handset communication capability: RA-A (Desk/Wall use)

Speaker-phone type station: RA-D (Desk/Wall use)

* Power source	DC 24V supplied by RAX Central Exchange Unit.
* Current consumption	DC 10mA (maximum)
* Communication	Loudspeaking voice-actuated.
	Voice-actuated with handset
* Calling	Pre-tone and call LED illumination
* Key pad	16 touch key buttons
* Station selection	2-digit dial (10 — 33)
* Mounting	Desk/Wall use

3. Open voice station: RA-B (Flush-mount)

* Power source	DC 24V supplied by RAX Central Exchange Unit.
* Current consumption	DC 10mA (maximum)
* Communication	Loudspeaking voice-actuated
* Calling	Pre-tone and call LED illumination
* Key pad	16-touch key buttons
* Station selection	2-digit dial (10 — 33)
* Mounting	Flush-mount to wall
* Front panel	Stainless steel

4. Open voice sub station: RA-C (Flush-mount)

* Power source	DC 24V supplied by Central Exchange Unit.
* Current consumption	DC 10mA (maximum)
* Communication	Loudspeaking voice-actuated
* Calling	Pre-tone and call LED illumination
* Key pad	2-touch key buttons
* Station selection	1 button (▶)
* Mounting	Flush-mount
* Front panel	Stainless steel

5. Paging adaptor: MC-A

* Power source	DC 24V supplied by Central Exchange Unit.%
* Current consumption	Maximum 20mA in standby mode
	Maximum 50mA (max.) in paging mode

6. Talkback adaptor: PB-YKX

* Power source	DC 24V supplied by Central Exchange Unit.
* Current consumtion	Maximum 2mA in standby mode
	Maximum 40mA (max.) in talkback paging mode

7. Remote control adaptor: RC-A, RC-B

* Power source	DC 24V supplied by RAX Central Exchange Unit
* Current consumption	Maximum 40mA (max.)
* Permitted contact capacity	Maximum AC 120V, 3A.
	Maximum DC 24V, 3A.
	Minimum applicable load: DC 5V, 100mA.

PERMITTED LINE DISTANCE

	0.5 mm	0.65 mm	0.8 mm	24 AWG	22 AWG	20 AWG
RAX CEU — RA-A, RA-C RA-B RA-D	350 m	600 m	900 m	1,200'	2,000'	3,000'
RAX CEU — MC-A RC-A RC-B	90 m	150 m	230 m	300'	500'	800'
RAX-CEU — PB-YKX	530 m	890 m	1,350 m	1,800'	3,000'	4,500'

X. Post Installation System Testing

Once installation is finished, testing is recommended prior to indoctrination of used personnel regarding operation of the system.

Proper installation of the RAX system, and its full range of communication functions, can be tested with three simple steps.

Step 1: Checking Station-to-Station Communication

● Select one station as the key station. Label it "S-1". Label remaining stations "S-2" through "S-n".

● Call S-2 from S-1 and confirm communication.

● Call S-1 from S-2 and confirm communication.

● Repeat process from S-1 to S-n until each station in the system has been tested.

Step 2: Checking Busy Tone signal

Using three stations (S-1, S-2 and S-3)

● Call S-1 from S-2.

● While S-2 is calling S-1, call S-2 from S-3 to confirm that Busy tone signal is heard.

Step 3: Checking Paging Function (If applicable)

Using S-1, page each zone (touch $\boxed{::}$ and 1,2,3 or 4), then depress $\boxed{\updownarrow}$ Talk button to confirm paging is transmitted to selected zone (If talkback function is included, release $\boxed{\updownarrow}$ Talk button to confirm talkback). To check remote control operation, touch $\boxed{::}$ and zone number button connected to the external devices, and momentarily depress $\boxed{\updownarrow}$ Talk button in handset. Depress $\boxed{0}$ button to confirm either continuous or intermittent tone.

Upon completion of the above tests, if any of the remaining communication functions are not found to work as prescribed in the Operations Manual, the cause is not due to improper installation. Rather, the Central Exchange Unit must be checked. If this is the case, an Aiphone Specialist must be consulted.

XI. User Indoctrination

Upon completion of post installation testing and confirmation of the system being fully operable, used personnel should be indoctrinated as to how to use the system.

The Operation Manual clearly describes all of the communication features of the system. A complete understanding of the operation of the system by those who will be using it well avoid post installation call backs and related service.

* Special Instructions:
   (1) Please turn on the power switch on the RAX C.E.U. after all the equipment wiring is completed. If intercom station(s) would be connected after system powered on, the station(s) would not work properly. Please turn off the power switch temporarily for about 10 seconds.
   (2) Do not make temporary operation of turning ON and OFF power switch again and again. At least 3 seconds have to elapse between ON and OFF operations.

XII. Trouble Shooting Guide

Incorrect wiring can be detected by the trouble mode as shown below;

Terminals \ Wiring mode	OPEN	SHORT
1 and 2	* No LED is lit. * No dial tone. * No communication.	* LED is lit. (cannot select) * Dial tone is heard (can be called) * No communication (cannot transmit voice signal to the other station)
1 or 2	* LED is lit. * Dial tone is heard. * No communication (cannot transmit voice signal to the other station)	
3 and 4	* No LED is lit. * No dial tone. * No communication.	* LED is lit. * No dial tone. * No communication (can transmit voice signal to the other station)
3 or 4	* LED is lit (can select, but cannot be called). * No dial tone. * No communication (can transmit voice signal to the other station)	
1 and 3	* LED is lit. * No dial tone. * No communication (cannot transmit voice signal to the other station)	
2 and 4	* LED is lit. * No dial tone. * No communication (cannot transmit voice signal to the other station).	
1, 2, 3 and 4 1 and 3 1 and 4 2 and 3 2 and 4		* LED is lit while depressing a number button, and goes out upon releasing. * No dial tone.

Wiring mode / Terminals	Wire crossed
1 ←→ 2	* LED is lit. * Dial tone is heard. * Can communicate.
1 ←→ 3	
1 ←→ 4	
2 ←→ 3	* LED is lit while dialing and goes out, upon releasing. * No dial tone.
2 ←→ 4	
1 ←→ 3 and 2 ←→ 4	

XIII. Servicing

1. Be sure to turn off power switch on RAX C.E.U. before you remove the cover of Central Exchange Unit.

2. Removing the cover of Central Exchange Unit will automatically activate the automatic switch and shut off the power. When the system has to be powered for testing, the automatic cutoff switch must be in a depressed position.

3. As the printed circuit boards in Central Exchange Unit employ MOS-ICs, do not touch the printed circuit boards. Doing so may damage the printed circuit boards with static electricity discharged from your fingers.

4. Before removing the printed circuit board: XC-063 (subscriber card), wait until all three (3) LEDs go out on the mother board (XC-064) after the power is off.

5. Before replacing any station, be sure to turn off the power supply.

6. When your RAX system includes paging amplifier(s) or remote control devices, turning on and off will cause noise through paging speakers and switchover of the remote control ON/OFF mode of the remote control devices. This is not due to equipment failure but rather what occurs when the power supply is turned on or off.

7. When replacing Cards, locate the Card in the right position by matching color of the Card with that on the chassis. Locate the subscriber card (XC-063) as from the position next to the voice-switching card (XC-062).